FEMORAL RUPTURE

CALLENDER

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ANATOMY OF THE PARTS

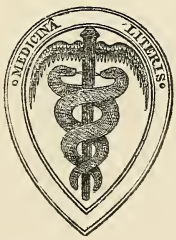
CONCERNED IN

FEMORAL RUPTURE

BY

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PREFACE.

THE treatises on femoral hernia which appeared towards the close of the last, and during the commencement of the present centuries, have well-nigh exhausted the study of the anatomy of the parts concerned in this disease, for the descriptions they contain, but little modified, are even now practically accepted.

I have ventured to test the accuracy of these descriptions, and at the same time to trace the extent to which they have been derived from the writings of yet older authorities, whose essays deserve more general notice than has of late years been accorded to them.

To avoid confusion, the anatomical description is given in the text, and is rendered as simply as a somewhat complicated nomenclature will permit. All that is collateral is embodied in a series of notes.

These notes are added with a double object. First, to introduce comments, which diverge somewhat from the study of anatomy; secondly, to facilitate a reference to the original observations of various authors. I have given extracts from recent publications so far only as they appear essential in the illustration of my subject, but with no intention of slighting the many interesting facts, or cases, which may be noted in their pages, where, however, they are easy of access and may readily be referred to.

The plates have been lithographed by Mr. Godart from my drawings of dissected preparations, which are represented, I believe accurately, in the exact relative proportions.

George W. Callender.

Queen Anne Street: *December* 1862.

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FEMORAL RUPTURE.

ANATOMY OF THE PARTS CONCERNED.

CRURAL or femoral rupture, hernia,[1] passes through the wall of the abdomen beneath the tendon of the

[1] *Hernia*, from ἔρνος, a branch, i. e. from the tumour protruding forwards; it has also been referred to the old Latin adjective hernius (see also hæreo), 'quod veteri Sabinorum lingua durus significat' (Mauchart *De Hernia incarcerata*, p. 81). 'Hernia, vel etiam juxta Castellum, crepatura' (Freytag, *De Oscheo-enterocele*, p. 45, ed. 1721. Also Albucasis, *Methodus Medendi*, lib. iii. cap. xxxv. p. 292. Basileæ, 1541). 'Crepatura, id est rima, locus cavus, aut iter cavum' (*Lexicon ad Scriptores mediæ et infimæ latinitatis*, Migne). John Gaddesden, author of the *Rosa Anglica* (1492), quaintly explains (p. 166) the term Hernia 'quasi rumpens enia, viz. intestina.' Ambrose Paré calls all ruptures 'hargnes,' because the patients are commonly 'hargneux' (morose). Further termed 'descentes' by A. le Quin and others (*Le Chirurg. Herniare*, Paris, 1697), and named by German writers 'ein bruch, ein leibschaden.' The word κῆλη (κηλέω, permulceo, or χαλάω, laxo) is used by Hippocrates when writing of ruptures, of which, according to Le Clerc (*Hist. de la Medicine*, part i. lib. iii. cap. viii.), he names the following varieties: 'tumeurs de l'aine, du scrotum, ou des testicules, causées par la chute de l'omentum, ou de l'intestin.' Some of these herniæ are described in works generally regarded as spurious; but as such works, if not Hippocratic, were written by his pupils, or by contemporary disciples of the school of Cnidus, it is certain that the Greek surgeons were thus early

external oblique muscle at the inner side of the femoral vein, and forms, when complete, a tumour upon the front of the thigh [2] about three quarters of an inch to the outer

(B.C. 430) acquainted with different forms of hernia. The word *ῥήγμα*, rupture, is also employed by Hippocrates, and its exact meaning has been much questioned. By most commentators it is thought to apply to a rupture or straining of fibres, occasioned by external violence (Littré, tom. v. p. 379); but in some passages it evidently relates to hernia (see, for example, Adam's *Translation*, vol. i. p. 200).

[2] *Femoral hernia.* This name, first employed by Morgagni (epist. xxxiv. c. 15), was brought into general use by Chaussier. The words *ἐντεροκήλη*, intestinal hernia; *ἐπιπλοκήλη*, omental hernia; *βουβωνοκήλη*, hernia descending no lower than the groin, were employed to indicate the varieties of rupture with which the ancients were familiar. Heister (*System of Surgery, Eng. Trans.* vol. ii. p. 54, 1753) has been at pains to state that Garengeot is in error when he affirms (*Traité des Opérations*, tom. i. p. 241, 1721) that crural hernia was known to the Greek writers; and Breschet, arguing in support of Garengeot, quotes a long passage from Dr. Freind's essay, which he oddly enough supposes to have been written by Paulus Ægineta (*Consid. sur la Hernie fémorale*, p. 41, 1819). Paulus (ed. René Briau, s. lxvi.), in common with other ancient surgeons, states that, 'the disease called bubonocele (*βουβών*, the groin) precedes the enterocele, beginning in distension. For at first the peritoneum being stretched, the relaxed intestine is for a long time arrested in the groin, and forms a bubonocele.' The inguinal rupture is here so clearly set forth, that it is impossible to suppose a reference is made to any other variety of hernia. Nor does Paulus, in any of his writings, show a knowledge of the crural rupture. With the exception of a remark by Celsus that hernia in woman 'fit præcipue circa ilia' (lib. vii. cap. xvii.), this variety is nowhere mentioned by early writers. Cases of iliac passion were, however, recorded; and to these and to the bubonoceles may fairly be referred the otherwise unrecognised femoral ruptures, e.g. Case IX. in the third book of the Epidemics (Hippocrates, *op. cit.* vol. i. p. 396). Paulus names hernia as one of the causes of ileus (book iii. sect. xliv. Adam's *Trans.*); and the same fact is recorded by Aritæus, and subsequently by Hildanus (*Centur.* 6.

side of, and the same distance below, the spine of the os pubis. The tumour is formed by some part or parts

Observ. 27, p. 545). This fatal disorder, the volvulus of Latin writers, vulgarly known as 'miserere mei,' was commonly called 'χόρδαψος,' from the firm and cord-like appearance of the intestine when distended above the point of strangulation (Paré, *Œuvres*, p. 198, c. xv. 1641; Barbette, *Op. omnia*, p. 177, ed. Genevæ, 1704; and Courtial, *Sur les Os*, p. 76, 1705). Freind (*Hist. of Physick*, vol. i. p. 164, ed. 1750), amongst other interesting details, refers to the statement of Fabricius, that a bubonocele and a varix of the femoral vein have often been mistaken for a bubo (*Op. Chir. cap. de bubonocele*, p. 557, 1620; also, Petrus de Marchettis, *Obs. Chir.* iv. ed. 1665). Alex. Benedictus mentions, in a very matter-of-fact sentence, the accidental opening of these herniæ: 'quo decepti plerique chirurgi, immisso scapello, cum pus subesse putarent, intestina vulnerarunt, paucisque diebus ægri mortui sunt, fœminis enim id malum sæpius accidit' (*Anat.* lib. ii. cap. v. Paris, 1514). Barbette, also referred to by Freind, seems to imply a crural hernia when he writes: 'experemur etiam processum peritonæi ita posse disrumpi, ut intestina non in scrotum, sed inter cutim et musculos, versus femur, sese urgeant' (Barbette, *op. cit.* p. 67). Nicholas le Quin had previously (1648) written as much on this form of rupture. 'Herniæ experiuntur quarum foramen proxime ad os pubis situm est; aliæ in ipso coxæ flexu collocantur, quæ magis sunt in mulieribus quam viris familiares, et subligaculum cum summa difficultate admittunt' (Barbette, *op. cit.* pp. 49, 50). Also, A. le Quin, who says: 'Les femmes ont leur hernies tout-à-fait dans le ply de la cuisse, où elles sont quelque fois bien enfoncées, parce qu'elles ont les os pubis fort-élevez' (*Le Chirurg. Herniare*, p. 62. Paris, 1697). See also Lavater (*De Enteroperistole.* 1672. Haller, *Disp.* tom. iii.), who narrates the case of one Magdalena Hauchet (p. 41); also his remarks (p. 50) 'Imo in mulieribus,' et seq. Also, Gouvillard (*In Celotom.* Obs. 19). That the peritoneum could be distended in this situation was shown by Nuck, who, in describing a case of dropsy, says that it spread and formed a sac in the thigh 'per vacua musculorum spatia.' Hildanus (quoted by Freind) also refers to an extension of the peritoneum 'circa foramina illa, circa quæ bubonocele fit in mulieribus.' I find a still earlier reference to these herniæ in the *Traité des Hernies*

which have escaped from within the cavity of the abdomen, such as, in the great majority of cases, intestine and omentum, and is covered by certain structures derived from the wall of the abdomen and from the tissues of the inner and front part of the thigh.

THE os innominatum[3] presents on its front aspect a considerable concavity, which inclines from behind,

of Pierre Franco, ed. 1561. He writes, p. 42, 'telles hernies se traitent comme les hernies ou ruptures des femmes, appelées bubonoceles aux hommes: qui est une relaxation aux eines; comme pourrez voir cy apres en son lieu.' And again, p. 51, 'Hernie inguinale se fait aux eines par le moyé des intestins ou zirbus, à cause que le peritoine fait un processus, ou eminence, à l'occasion des intestins ou zirbus: les quels ne suyuent par le didyme ou processus; ains passent par les costez vers les eines, et alors ne peuuent descendre bas mais sont là retenuz et font eminence. Et cette espece de hernie est ronde,' et seq. Paré also writes, 'Les femmes qui ont porté de gros enfans par la grande distension du ventre, la plupart sont affligées d'une hargne intestinale, en laquelle leur tombe l'intestin en l'aine' (*op. cit.* p. 195, cap. xiv.). Verheyen, Garengeot, and Freind, about the same time (1693 to 1710) separately described the crural hernia (mērocele); but a distinct account of the disease was arrived at by slow degrees. Breschet states (*Consid. sur la Hernie fémorale*, p. 41) that it is referred to by Riolan (*Op. Anat.* lib. ii. cap. xii. ed. 1649). This is an error; the text makes no mention of the subject. The treatment of these herniæ, and operations for the relief of their strangulation, were well understood and well described long before their anatomical relations were accurately defined. (See N. le Quin, *op. cit.*; Petit, *Mal. Chir.* tom. ii. ed. 1790; and Richter, *Traité des Hernies*, 1770.)

[3] *Os innominatum.* First named by Oribasius *ἀνώνυμον* (*Oribasii Anat.*, Dundass, p. 164). The entire bone also called ischium (Hippocrates, *op. cit.* p. 660).

Galen writes simply, 'de ossibus quæ cum osse sacro committuntur quibus nullum nomen inditum est' (*De Ossibus*, F. Balamio interp. ed. 1535). The anterior superior spine of the ilium is described as external, superior and posterior in its

forwards, downwards, and inwards, and is bounded on the outer side by the anterior superior spine of the ilium,[4] and on the inner by the portion of os pubis[5] which articulates with the opposite bone.

Below and on the inner side of the superior spine of the ilium, but separated from it by a shallow notch, is the inferior spinous process, a prominence which varies considerably in size in different subjects. Internal to this inferior spine, and above the acetabulum, is a second and deeper notch, beyond which the bone again rises (ilio-pubic eminence[6]), but a third time becomes depressed and slightly excavated as it slopes towards the spine of the pubes. The outer and middle notches are filled by iliacus internus and psoas[7] muscles, which here pass out from the iliac fossa accompanied by several nerves, and by the lymphatics passing, in the opposite direction, from the thigh and from the parietes of the abdomen.

The body of the os pubis,[8] on which the remaining

relation with the spinous process of the os pubis, which is internal, inferior and anterior (J. Cloquet, *Recherches Anat. sur les Hernies*, p. 57).

[4] *Ilium.* 'Os ilium ita dictum quod intestinum ilium ipsi adjacet' (Verheyen, *Corp. Humani Anat.* p. 557, ed. 1731).

[5] *Ossa pubis.* ἤβης ὀστᾶ (Oribasius, *op. cit.* p. 164).

[6] The *ilio-pubic*, commonly described as the ilio-pectineal eminence, marks the junction of the ilium with the os pubis. Distinct in early life, these bones are united about the twentieth year so as to form but one.

[7] *Psoas.* Ψόα, the loin, named and described by Hippocrates (*op. cit.* Articulations, p. 608; also Mochlicus, p. 661).

[8] *Os pubis.* 'La plus grosse des portions que cette échancrure sépare, s'appelle le corps du pubis;

excavation is situated, is bounded internally by the symphysis, and here articulates with the bone of the opposite side. A distinct elevation, the crest, extends outwards from the symphysis upon the upper surface. The edge of this crest is well defined on its lower margin, but the upper slopes gradually towards the back of the os pubis. Facing the symphysis it is smooth and rounded, but on the outer side ends abruptly in a pointed extremity, which is called the spinous process.[9]

From this spinous process two ridges descend, their height lessening as they extend outwardly. Diverging from each other, the anterior (pubic ridge), at first broad but presently sharply defined, extends to, and partly bounds the oval foramen, and is lost upon the

l'autre se nomme la branche' (Palfin, *Anat. Chir.* tom. i. p. 153, ed. A. Petit, 1753). The body of the bone includes all that portion which extends from the acetabulum to the symphysis. This portion is also named horizontal ramus, or the crus, by various anatomists. Dr. Quain calls the central expanded part the body, and describes as rami the horizontal and descending portions which branch from it. To limit division of the bone into body and descending ramus appears the more desirable in consequence of the intimate relations which naturally exist between the parts which must, theoretically, be separated to make up a horizontal ramus as distinct from the body.

[9] *Spinous process.* Various names have been applied to the prominent portions of the os pubis. Palfin and Mauchart describe a crest which they call the spine of the os pubis. J. Cloquet, however, calls the ilio-pubic ridge 'la crête du pubis.' Hesselbach and Scarpa write of the spinous process as the tubercle. A. Cooper, objecting to the name 'spinous process,' writes 'tuberosity.' Koch and Garengeot speak simply of the sinuosity of the upper part of the bone.

inner side of the acetabulum. It is covered by a continuation of the sub-peritoneal fascia, over which the pectineus muscle passes towards the thigh. The posterior ridge (ilio-pubic) is continued backwards to the extent of about half an inch, is then depressed and flattened for another half inch, and so reaches the back of the os pubis, where it again becomes well-defined as it curves towards the sacrum and forms the upper, lateral, margin of the true pelvis.

In front of this ridge is the narrow origin of the pectineus muscle,[10] (from the spinous process of the os pubis to within half an inch of the ilio-pubic eminence); elsewhere the immediate covering of the bone is a dense fibrous tissue (to which the muscle is sometimes adherent, but from which it is usually separated by cellular tissue) which is continuous on the outer side with the sub-peritoneal fascia, and mounts on the inner to be prolonged over the spine and crest.

The triangular portion of bone between the two ridges, narrow on its inner side and broad externally, forms the remaining smooth surfaced depression for the passage of the femoral vessels, and of numerous lymphatics from the lower extremity.[11]

[10] *Pectineus*, sub-pubic, pectinalis (*Albinus*, tab. 22, figs. 5, 6, ed. 1734). Cloquet (*Recherches Anat. sur les Hern.* p. 57) and others are in error when they give the origin of this muscle from the greater part of the triangular surface between the ridges. (See the transverse markings, Plate I.)

[11] Anatomists for a long time committed the mistake of placing the spermatic vessels upon the

The distance between the spine of the ilium and that of the os pubis, as measured on a series of ossa innominata, is shown in the following table (*a*).

	Adult Male Pelvis.		Adult Female Pelvis.	
	(*a*) inches	(*b*) inches	(*a*) inches	(*b*) inches
1	*3·6	·8	4·4	·9
2	4·4	·7	4·5	·9
3	4·5	1·1	4·6	·9
4	4·6	·6	5·1	·9
5	4·6	·8	5·1	·9
6	4·75	·8	5·1	·7
7	4·75	·9	5·1	·7
8	4·75	1·1	5·2	·8
9	4·75	·8	5·2	·8
10	4·75	·8	5·2	·6
11	5	·8	5·3	·7
12	5·3	·7	5·5	·5

* Pelvis of a Lascar.

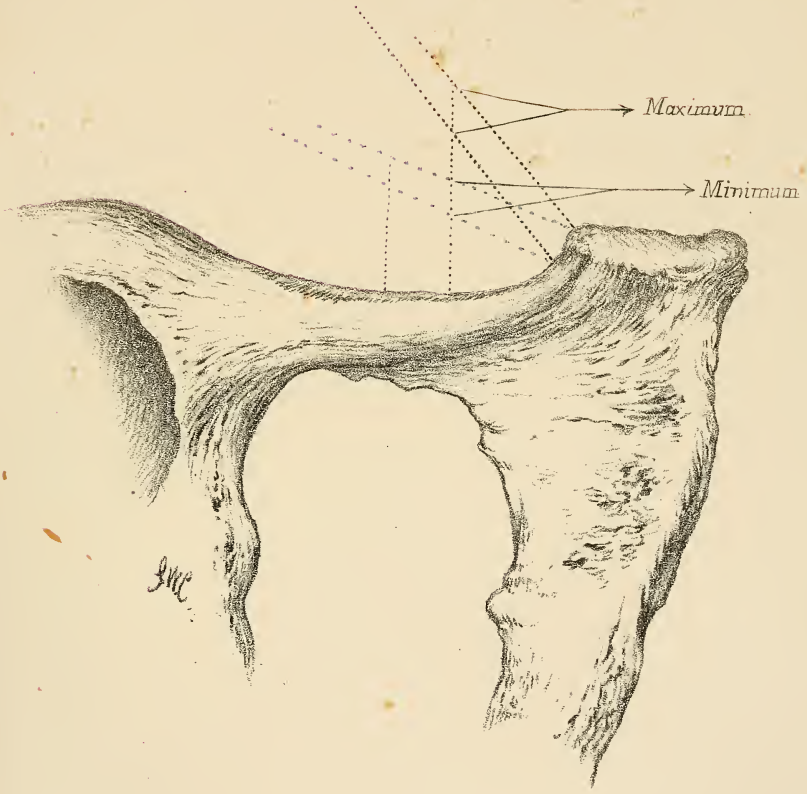
The figures in columns *b* represent the vertical distance between the upper triangular surface of the os pubis and a point one inch from the inner extremity of a line drawn from the anterior spine of the ilium to the spinous process of the os pubis. The distance

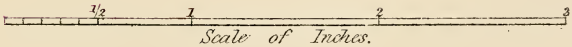
concavity of the os pubis by the side of the crural vein. Hence, in part, their exaggerated fear of wounding these vessels in operating upon strangulated femoral hernia in the male. See amongst others Riolan (*Opera Anat.* p. 513), 'In foraminis (thyroid) parte superiore sinum quidam oblique declivis adest, per quem vena et arteria cruralis et vasa spermatica deferentia demittuntur, atque ejaculantia superne remeant.' Also Vesalius (*De Corp. Hum. Fabrica*, lib. i. cap. xxix. fig. 2, 1543). Günz is the first to affirm that the spermatic artery is out of harm's way, unless the upward incisions through the external oblique are made needlessly large and free. (*Libellus de Herniis*, p. 78.)

PLATE I.

Showing elevation of spinous process of os pubis. The black lines indicate the maximum, the blue lines the minimum measurements referred to in the text, page 8.

Plate I.





Scale of Inches.

varies according to the width of the os innominatum, and the depth of the triangular space contained by the vertical and oblique lines is practically somewhat reduced by the downward curve of the tendon of the external oblique muscle. The deviations from the rule, shown in the Table, are caused by the varying height of the pubic spine. Hence the space enclosed between the bone and the above-mentioned lines varies in accordance with the height of this process, and its depth, so far as this depends upon the prominence of the spinous process, is never balanced by compensating differences in the width of the pelvis. The extreme measurements are shown in the accompanying drawing. (Plate I.) These variations are important, as determining the depth of the space permissive of the descent of a femoral rupture.

THE lower aponeurotic border of the external oblique [12] muscle of the abdomen stretches from the

[12] *External oblique.* The muscles of the abdomen, excepting the psoæ, were imperfectly known to the earliest anatomists. Lycus, Marinus, and Galen were amongst the first to describe them with anything approaching to accuracy (Galen, *In Lib. Hip. de Nat. Hum. Comment.* 2). The cremasters were discovered by Oribasius; the pyramidales, said (Riolan, *op. cit.* lib. ii. cap. viii.) to have been first described by Columbus, are, on the contrary, regarded by him as portions of the recti (*De Re Anat.* p. 262, ed. Paris, 1572). According to Bartholinus (*Instit. Anat.* p. 22, ed. 1641), they were first mentioned by Fallopius. The descriptions of the abdominal muscles by Zerbus (*Lib. Anat. Corp. Hum.* p. 9, ed. Venet. 1502), Albinus and Vesalius (*op. cit.*

anterior spine of the ilium to the os pubis. In its course it is curved towards the concavities of the bone

infra), are sufficiently correct. Berengarius (Carpus) adds an account of the linea alba (*Isagogæ Breves*, p. 11, 1523). The lower border of the external oblique is first alluded to by Vesalius (*Corp. Hum. Fabrica*, lib. ii. c. 31), as is admitted by Fallopius (*Obs. Anat.* p. 42). It is mentioned as a distinct ligament by Garengeot, Winslow, (*Expos. Anat.* p. 13, ed. Paris, 1776), and others. It is regarded as the aponeurosis of the external oblique by Heister (*Compend. Anat.* not. 4, 1741); Morgagni (*Advers. Anat. Omnia*, lib. iii. p. 2, 1741); Duverney (*Œuvres Anat.* vol. i. p. 129, 1761); and Sabatier (*Traité d'Anat.* vol. i. p. 252, 1781). It receives many names. From the French that of 'l'arcade crurale,' because its anterior edge forms a slight curve with the convexity downwards. It is also known as the ligament of Vesalius, of Fallopius, of Poupart; as the suspensory ligament (*Hist. Ac. Reg. Sc.* l. c., also Morgagni, *op. cit.* lib. iii. p. 2), the 'ligamentum inguinale externum' (Hesselbach), and the pubic ligament ('id quod auctores ligamentum pubis vocant' J. Douglas, *Descrip. Musc.* p. 30, 1738). Garengeot describes it as a ligament twice as thick as the aponeurosis of the muscle (*L'Anat. des Viscères*, sec. ed. vol. i. p. 115. Paris, 1742), but Duverney explains the strength of this lower border of the external oblique, by stating that it 'se replie un peu en dedans et s'unit étroitement à la gaîne tendineuse qui embrasse les muscles fléchisseurs de la cuisse,' and by this portion gives origin to the internal oblique (Duverney, *op. cit.* p. 129). Schacher also described this aponeurosis as 'introrsum replicata' (Haller, *Disp. Chir.* tom. iii. *De Morbis a Situ Intest. Mutat.* p. 24). The inner extremity of this aponeurosis has long been noticed as attached to the os pubis, 'ejus cauda pro minori parte definit in osse pubis' (Verheyen, *Corp. Hum. Anat.*, p. 68, ed. 1731); 'Se inserit tuberculo ossis pubis ac margini superiori ossis pubis, inde latior tendo est quam quidem prima fronte videtur' (Camper, *Icones Hern.* p. 11, ed. 1801). Garengeot gives it as inserted into the external side of the sinuosity of the os pubis (*Surgery, Eng. Trans.* p. 87, ed. 1783). Hesselbach describes it as fixed to the tuberosity of the os pubis, and to the upper margin of the horizontal ramus of the same bone (*De Ortu et Progressu Hern.* ed. Ruland. p. 3, 1816). The latter connexion is noted more distinctly by Gimbernat (*Nuevo Methodo de Operar en la Hernia Crural.* Madrid, 1793).

beneath. The entire tendon is joined on its front surface by the deep subcutaneous fascia, and by the fascia lata of the thigh; by the internal oblique and transversalis muscles on the outer half (more or less) of its inner aspect, and on the same side in its entire extent by the sub-peritoneal fascia. The outer half of the tendon is thicker and stronger than the inner, owing in chief to its connexion with the subjacent muscles. Above the pubic spine it divides into two portions, and permits the passage from the abdomen of the spermatic cord in the male, and of the round ligament in the female. The inner of these sub-divisions

The description of the tendon of the external oblique which is given in the text, applies most correctly to the adult, when the parts referred to below have become firmly adherent to one another. In young subjects it is easy to trace the following arrangement of the various fasciæ. The fascia lata of the thigh, along the lower border of the external oblique, divides into two other fasciæ, or rather blends with them; the first of these is continued upwards over the abdomen in front of the external oblique muscle (the deep superficial fascia of adult life); the second (sub-peritoneal fascia) by one branch ascends beneath the transversalis muscle, and by another extends itself over the iliacus and psoas. The deep groove formed at the junction of these structures is filled by the lower border of the external oblique, to which in its outer half the transversalis and internal oblique muscles are attached. So firm, indeed, is the band formed by these fasciæ, that the external oblique may be turned out of its groove without impairing the apparent strength of the so-called crural arch. But these structures, as life advances, coalesce, and thus it becomes more correct to describe the external oblique as forming the ligament, for, besides being the chief and strongest of the fibrous bands, it holds the central position, and there unites to itself the various fasciæ. (See on this subject Liston, *Surg. Anat. of the Groin*, p. 12, also some remarks by Morton, *On the Groin*, p. 127.)

passes to the crest of the pubes, where it is connected with fascia covering the bone, with the symphysis, and with the middle line of the abdomen (linea alba).

The outer division, thick and strong as compared with the preceding, is attached to the spinous process of the os pubis, and thence inclining backwards, is fixed for some distance to the ilio-pubic ridge. By this twist backwards and inwards the tendon fills up the angle which would otherwise have been left between its lower border and the ilio-pubic ridge. Broad and strong anteriorly, and in the upright position of the body nearly horizontal in its direction, this portion ends in a thin but well-defined posterior border, about one inch from the outer side of the pubic spine. It is often perforated by small openings for the passage of some of the lymphatics from the lower extremity.

The concavities of the bones, and the lower border of the tendon of the external oblique, contain between them the following structures, which are, however, separated from one another by bands of fibro-cellular tissue, passing, without order, between the tendon and the coverings of the bones, and by which in great measure the convexity of the former is determined. On the inner side, close to the curved posterior edge of the tendon,[13] are a number of lymphatic vessels

[13] *Gimbernat's ligament* is the name applied by anatomists to this part of the aponeurosis. 'The name is objectionable, because it refers to one portion only of the tendinous expansion,

surrounded by fat, in the midst of which an absorbent gland is occasionally found. Next in order, towards the outer side, is placed the femoral vein, then the femoral artery and the crural nerve, then the psoas muscle, the anterior crural nerve, the iliacus internus muscle, and often, close to the inner side of the anterior spine of the ilium, the external cutaneous nerve. Here and there, but chiefly in front and to the outer side of the artery, sundry lymphatics other than those already mentioned also find a road from the thigh and from the anterior wall of the abdomen.

Femoral herniæ, with few exceptions, descend to

and further, leaves the impression of its being a distinct structure.' The extent to which the external oblique is attached to the ilio-pubic ridge, is given by Cloquet as from 6 to 10 lines, by Lawrence as from $\frac{3}{4}$ to 1 inch. Monro says it is thicker and stronger in the male; and Breschet, in general terms, makes the same statement (*Consid. sur la Hern. Fémorale*, p, 82, 1819). Hesselbach figures a great difference as between the male and female in this respect (*op. cit.* plates iii. M. and iv. F.). Cloquet states that no such difference exists, but adds, 'this ligament is sometimes cellular, and sometimes wholly wanting' (*Recherches Anat.* p. 59). I confirm the accuracy of Cloquet's observation, and agree with him that it can have little, if any, influence in determining for females their greater liability to crural hernia as compared with males. The smallness of the inguinal rings in the one sex, and their large size in the other, sufficiently account for the relative frequency of the femoral rupture in women, and of the inguinal in men. When weak, or when perforated by openings of unusual size, this portion of the external oblique tendon allows a femoral hernia to force a passage through it; e. g. *Museum St. Barthol.* Series xvii. 52.: 'Femoral hernia. A small peritoneal sac has been protruded between the fibres of Gimbernat's ligament. A bristle is passed beneath the portion of the ligament which intervenes between this peritoneal sac and the space through which the femoral hernia passed.'

the groin along the course of the principal lymphatics, and are thus bounded as they pass out on the inner side by the posterior edge of the external oblique tendon, on the outer by the cellular tissue which surrounds the femoral vein.

The structures lying beneath, and bound down by the external oblique, are covered outwardly by the integument and by the fasciæ of the thigh, inwardly by the sub-peritoneal fascia, and by the peritoneal lining of the abdominal cavity.

AFTER reflecting the integument from the front of the upper part of the thigh, and from the corresponding lower part of the abdomen, we bring into view the fat which occupies the subcutaneous cellular tissue, [14] and which varies in quantity in different subjects, from scarcely any to a compact layer, one or even two inches in thickness. Of the cellular tissue, common alike to the abdomen and to the thigh, we observe that the deeper portion (for it can generally be divided into two or more layers) is firmly adherent to the lower edge of the tendon of the external oblique, and is continued above this line, in the male into either

[14] *Subcutaneous tissue.* Very imperfectly described by early writers on Anatomy (see Malpighi, quoted by Palfin, *op. cit.* tom. ii. p. 117). Different layers noticed by Verheyen, 'interim non adeo obscure apparet duplex' (*Corp. Hum. Fab.* p. 66, 1731). Also by Bartholinus (*Instit. Anat.* p. 22, 1641). The subcutaneous fascia is usually thicker in thin than in fat subjects. It affects but little, if at all, the tension of the tendon of the external oblique.

scrotum, in the female into either labium, passing as it descends over the spermatic cord or the round ligament.

By the attachment of this tissue to the aponeurotic tendon of the external oblique, a barrier is formed between the abdomen and the thigh. Hence, as is well-known, fluids, when accumulating beneath this the deeper layer of subcutaneous tissue, are unable to pass from the one region to the other.

Downwards, upon the front of the thigh, this tissue continues its adherence to the muscular fascia (fascia lata), especially on the outer side, where the deeper layer is inseparably connected with it. On the inner, or pubic side, it is comparatively unattached, and only united, sewn as it were, to the muscular fascia by the numerous lymphatics which traverse it, thread-like, in all directions.

Removing the subcutaneous tissue, the fascia lata[15]

[15] The *fascia lata* (fascia femoris ; the name 'fascia lata' is reserved by Cruveilhier for the covering of the muscles on the outer side of the thigh) should be dissected on a young subject, for on the middle-aged and the old, its relations are less easily shown, by reason, chiefly, of its irregular thickening or wasting around the femoral glands. Its connexion with the external oblique is first distinctly described by Mauchart (*De Hern. Incarcerata*, p. 79, 1722, also *De Hern. Crur.* p. 167); Garengeot (*L'Anat. des Viscères*, vol. i. p. 116, sec. ed.), and subsequently Breschet (*Consid. sur la Hernie Fém.* p. 129), state that it forms the outer layer of the portion of external oblique tendon attached to the os pubis. On dividing the fascia lata on the dead subject, the lower border of the oblique tendon relaxes and rises up (Scarpa, *op. cit.* p. 268). Hence the practice of bending

is seen investing and binding the muscles of the thigh. Above, it is continued in part from the fascia covering

the thigh inwards before attempting to reduce a femoral rupture, in order that the fascia may be relaxed from above the tumor. Hence also in cases of strangulated crural hernia some surgeons recommend its division parallel with the tendon, so as to relieve stricture by relaxing the latter. That the fascia lata was in itself an occasional cause of the stricture in these cases was known to Günz, Bertrandi, and Richter. The last named refers to this constriction as increasing with the density of the fascia, especially when its layers are thickened about enlarged femoral glands (*Traité de Hernies*, p. 247). Garengeot first applied to practical surgery the division of tense layers of fascia lata for the relief of strangulated ruptures (*Mém. de l'Acad. de Chir.* tom. i. p. 707).

Burns remarked that a large and distinct opening occasionally existed in the fascia for the passage of the saphenous vein. Hence the name, 'saphenous opening,' applied to this foramen (*Edin. Med. and Surg. Journ.* vol. ii. p. 269). After Burns, who admitted that this opening was often replaced by reticulated material, other anatomists insisted upon its presence, not occasionally, but in all cases, and it was minutely described in various anatomical works. The saphenous opening, when it does exist, which is seldom the case, results from the wasting (absorption) of portions of fascia lata, probably from the continued pressure of enlarged glands. The opening, or openings, thus formed, leave isolated bands which oftentimes constrict and strangulate a femoral rupture. The appearances presented under such circumstances are shown Plate IV. figs. 1 and 2.

Anatomists who describe a saphenous opening, write of the inner portion of the muscular fascia as the 'pubic,' of the outer as the 'iliac.' The last named forms the well-defined external margin of the aperture, curving above, in front of the femoral vein, to reach the inner extremity of the external oblique tendon, passing below beneath the saphenous vein to join the pubic layer, which here covers the pectineus muscle, and thence extending under the femoral vein and artery to the bone, and to the fascia iliaca. Gay describes the outer margin of the saphenous opening as formed by a folding back of the fascia lata upon itself. 'Having advanced to and formed the iliac portion of the margin of the saphenous opening, the iliac fascia lata becomes abruptly reflected back upon

the front of the abdomen (Note [12]), and in the adult is connected with the entire lower border of the external oblique, whence it descends to the knee. The innermost portion, after covering the outer (femoral) surface of the external oblique tendon [16] where the latter is attached, as also is the fascia lata, to the ilio-pubic ridge, passes over the front of the pectineus muscle, rises somewhat abruptly over the femoral vein, and thence, becoming stronger and more dense, is con-

itself; in such manner that, as far as the inner edge of the sartorius and the crural arch, this portion of the fascia becomes a double layer. . . . The pubic portion of the fascia lata is a single layer applied upon the pectineus and long adductor muscles. It is continuous with the inner and lower half arch of the saphenous margin, or Burns's ligament; and indeed results from the gradual unfolding of the double layer of which it is constituted.' The whole upper free edge of the iliac fascia lata is commonly called the 'falciform process,' whilst its deeper fibres receive the name of 'Burns's ligament.' Hey's femoral ligament would appear to consist of distinct fibres connected with the inner fold of the iliac fascia, which extend immediately beneath the tendon of the external oblique to the subperitoneal fascia. The upper border (cornu superius annuli cruralis anterioris, Hesselbach) of this opening thus receives, by an unfortunate complication, the names of 'Falciform process,' 'Femoral ligament,' 'Burns's or Hey's ligament.' (See Gay on *Fem. Rupture*, p. 9, who has collected the various descriptions of this fascia and commented on them with great care; also Breschet, *op. cit.* p. 129.) Amongst earlier works, the best drawings of this opening are given by Hesselbach (*op. cit.* pl. 2), and more recently by Blandin (*Anat. Typographique*, pl. 6). The various divisions of the iliac fascia lata depend in great measure upon the skill of the dissector, and are, in my opinion, artificial. (See further, Morton, *Surg. Anat. of the Groin*, p. 109, et seq.)

[16] Qui se trouve ainsi divisé en deux parties, l'une supérieure ou antérieure, l'autre inférieure et postérieure ou interne (Scarpa, *Sup. au Traité Prat.* p. 35, pl. 13).

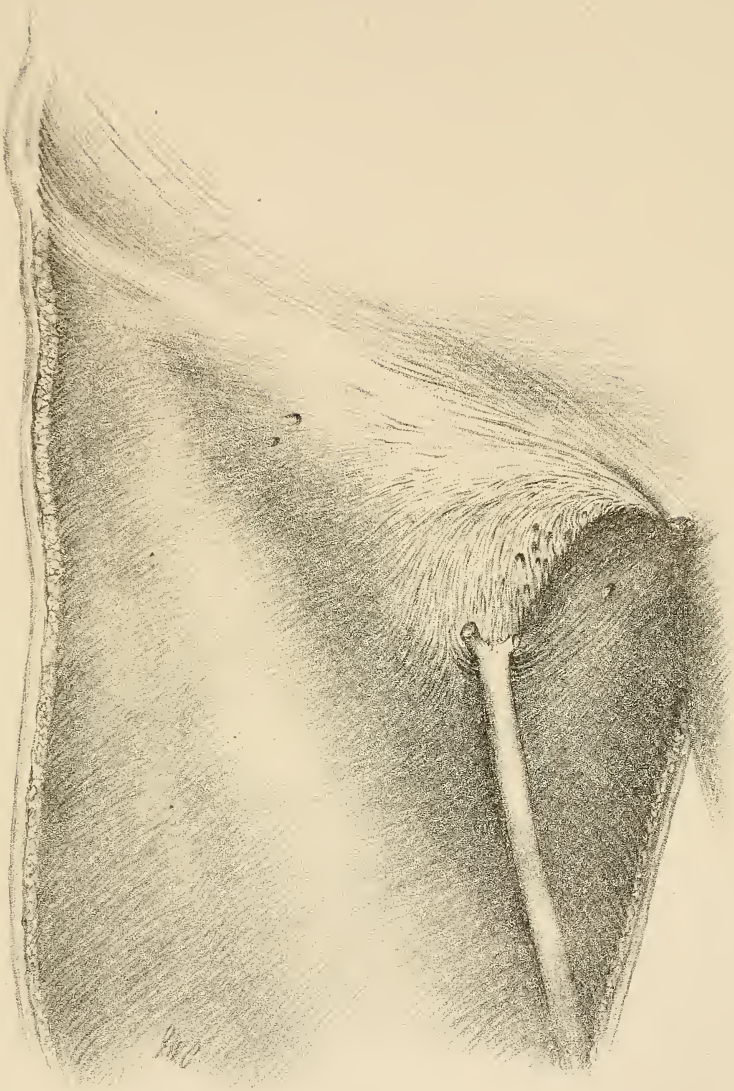
tinued to the outer side of the thigh. (Plate II.) The prominent position of the femoral vein, as this vessel lies on the pectineus supported on the outer side by the corresponding artery, leaves on the inner an angular depression [17] occupied by many glands and absorbents, which here rest on the outer surface of the fascia lata, surrounded by a varying amount of fat.

In the subcutaneous tissue of the front of the thigh, between its layers or adherent to them, superficial nerves (from the ilio-inguinal and crural branches), arteries, veins, lymphatic glands and vessels, distribute themselves. They penetrate the fascia lata to join structures more deeply seated. The arteries are traced to the femoral, the veins open into the femoral, and most of the efferent lymphatics enter the abdomen beneath the tendon of the external oblique on the inner side of the crural vein, and join the lumbar glands. Numerous perforations in the fascia lata leave passages,

[17] Named by Gay 'Femoral Fossa' (*op. cit.* p. 9). The crural glands were at one time described as arranged for the protection of the femoral vein and of the vessels joining it, 'quo injuriis minus redderetur obnoxia' (Vesalius, *Corp. Hum. Fabrica*, lib. iii. cap. x. 1543). Their connexion with the lumbar glands is described by Riolan (*Op. Anat. Anthrop.* lib. ii. cap. x. p. 92, ed. 1649). Instead of regarding the fascia through which the absorbents pass from the thigh as part of the fascia lata, some anatomists take it for a deep layer of the superficial fascia (cribriform fascia), others look upon it as part of the so-called sheath of the femoral vessels, whilst others consider it as an entirely distinct structure arising from the margin of the saphenous opening. Mr. Holden refers to it as a portion of the fascia lata (*Manual of Anatomy*, sec. ed. p. 417).

PLATE II.

Fascia lata, its uninterrupted extension over the femoral vessels, the opening for the saphenous vein, and apertures for the passage of lymphatics.



½ 1 2 3

Scale of Inches.

without however destroying its continuity, to and from the parts beneath, and thus, amongst other vessels, it is traversed by the lymphatics, some by the side of the femoral vein, but the greater number a little distance from its inner wall, just where the fascia lata extends direct from the external oblique to the surface of the pectineus. (Plates II. and IV.)

The more considerable openings are, however, for the veins. The largest is for the vessel (internal saphenous) which brings the blood from the superficial tissues on the inner side of the lower extremity. In front of this vein, as it passes into the femoral, the fascia lata adheres firmly to its walls, but behind forms a lunated margin, upon which the vein rests (usually about one inch and a quarter below the tendon of the external oblique), and with which it is only loosely connected by cellular tissue. (Plates II. and IV.) The sharp edge which this margin presents is due to the sudden lifting of the fascia from the pectineus muscle to pass in front of the femoral vein, where joined by the saphenous. If the handle of a scalpel is passed between the pectineus and the fascia lata, and pushed forwards on the inner side of the vein so as to raise the fascia above this margin, the sharp edge is at once lost sight of, and the continuity of the fascia in front of the pectineus, elsewhere ascending smoothly over the femoral vein, is shown to be unbroken.

The circumflexa ilii, the epigastric and the pudic

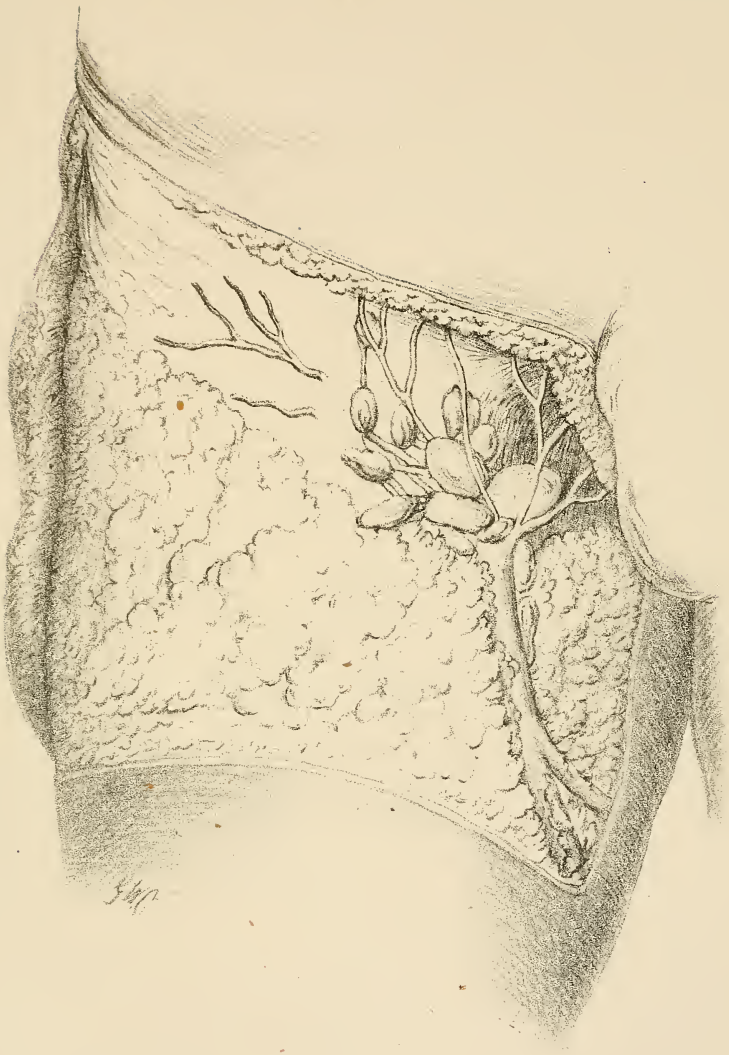
veins,[18] all superficial and varying in number, converge towards the saphenous and, for the most part, join it before it perforates the fascia. Connecting these veins is the fat and subcutaneous tissue, traversed in all directions by lymphatics which here extend between adjacent glands. It is these structures, thus interwoven, which resist the further descent of any femoral rupture which has made its way through the fascia lata to the front of the thigh. Compressed by the hernia they are moulded into a pouch which receives and restrains the protruding intestine, the maximum of resistance being attained at the point of convergence of the principal veins. (Plate III.) Thus hindered in their downward descent it is easier for these herniæ to extend on either side and in an upward direction, and accordingly they do so.[19]

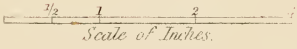
[18] *Superficial veins.* The pressure, long continued, of a femoral hernia upon these veins sometimes causes them to become dilated (varicose). In this change, the internal saphenous occasionally participates, and when its upper extremity is much enlarged, a tumour is formed, which a careless observer may confuse with a rupture. These changes were first described by Koch (Haller, *Disp. Chir. Select.* tom. iii. p. 264). If in operating upon a strangulated rupture the bleeding from these veins is troublesome, the vessels which have been wounded should be cut across and then tied. Richter (*op. cit.* p. 243), Scarpa (*op. cit.* p. 245), and other surgeons write of œdema of the lower extremity as being symptomatic of femoral hernia. It is seldom the pressure is so great as thus to obstruct the return of blood through the femoral vein, protected as this vessel is by surrounding cellular tissue. For a case in which the femoral artery is said to have been partly obliterated by the pressure of a crural hernia, see Cloquet (*Path. Chirurg.* p. 88).

[19] The tumour formed by the projection of a femoral hernia is, as a rule, of an oval shape, its long

PLATE III.

Subcutaneous structures, the arteries being removed, described as conjointly hindering the descent of a femoral hernia.




1/2
1
2
Scale of Inches.

LEAVING for the present the structures which cover the muscles on the inner and front part of the upper third of the thigh, I pass to the wall of the abdomen. Internally it is lined by peritoneum. In its lower half this membrane spreads over the recti and transverse

axis following the line of the lower border of the external oblique, in rare cases as far as the anterior, superior, spine of the ilium. Sometimes it extends above this tendon upon the front wall of the abdomen. A point to be remembered in attempting its reduction. Morgagni, most careful and painstaking in all his observations, in commenting on a case reported by Mery remarks the peculiar shape of these tumours: 'It is surprising that it should be scarcely taken notice of by any of the authors who have written of ruptures since that time; I mean that it extended from the left groin quite to the middle of the thigh' (*Epist.* xliii. c. 6). He is correct in noting that these herniæ in some instances, overpowering all resistance to their descent, extend down the inner and front part of the thigh. Scarpa (*op. cit.* p. 242) names a case in which the rupture descended below the upper third of the thigh. Mery, one of a marvellous character, in which part of the colon and four feet of small intestine were removed from one of these large crural ruptures, the patient recovering with an artificial anus (*Mém. de l'Acad. des Sciences, obs.* 4, 1701); and Courtial refers to a case scarcely less remarkable (*Sur les Os*, p. 73, 1705; also, Mauchart, *De Epiplo-enterocele crural*). It is not often that these ruptures attain any great size. Those needing an operation for relief of their strangulation are almost invariably small. I do not find one amongst ninety-two cases where the tumour was so large as to attract particular attention. 'Les plus petites étant pour l'ordinaire les plus dangereuses, et les plus sujettes à l'étranglement; surtout à l'égard des femmes' (A. le Quin, *op. cit.* p. 60, ed. 1697).

The following table shows that it is not the operation, in itself a small hurt to the patient, which in these cases kills, but the delay in having recourse to it for the relief of the strangulated gut. The cases extend over four years, and are given as fairly illustrating the results usually obtained. The words 'taxis' and 'no taxis' apply to treatment prior to the patient's admission, the taxis having been employed roughly, with undue violence: —

muscles, extends on either side upon the psoas and iliacus, and towards the middle line dips into the basin of the true pelvis.[20]

At the site of the outer border of either rectus a fibrous cord ascends from the pelvis, and from the side of the bladder, towards the umbilicus. As it curves

OPERATIONS FOR THE RELIEF OF STRANGULATED HERNIA AT ST. BARTHOLOMEW'S HOSPITAL.

		1852—53		1855—56		Totals	
		Cases	Died	Cases	Died	Cases	Died
Femoral	No sac	1	1	...	...	1	1
	Sac opened	10	4	10	9	20	13
	Sac not opened	7	2	17	4	24	6
Inguinal	Sac opened	8	5	3	...	11	5
	Sac not opened	5	1	8	5	13	6
Umbilical	Sac opened	2	1	1	1	3	2
		33	14	39	19	72	33

Recovered	Sac opened	14	Taxis, 4	Average Strang.	21 hours
			No taxis, 10	,, ,,	30 ,,
	Sac not opened	25	Taxis, 6	,, ,,	11 ,,
			No taxis, 19	,, ,,	22 ,,
Died	Sac opened	21	Taxis in all	Average Strang.	72 hours
	Sac not opened	12	Taxis, 8	,, ,,	120 ,,
			No taxis, 4	,, ,,	86 ,,

[20] Peritoneum, *περιτείνω*. 'Dicitur autem peritonæum ab officio scilicet quo fungitur. Prætenditur enim non tantum infimo ventri universo, sed etiam omnibus ipsis inclusis visceribus, quibus membranam largitur' (Spigelius, *De Corp. Hum. Fab.* cap. iv. ed. Ams. 1745). The Syphac of Arabian surgeons.

upwards, projecting from the inner wall of the abdomen, the peritoneum is continued over it so as to leave on either side a pouch or fossa, more distinctly marked for a short distance above the level of the os pubis than elsewhere. The fibrous cord is the shrunken remnant of the obliterated hypogastric artery,[21] and the fossæ, variable as to size, are named external or internal, as they happen to lie on its outer or inner side. Of the two the external is the larger, and the peritoneum which forms it is commonly protruded as part of a crural rupture. The fibrous cord is situated about one inch behind, and about the same distance to the outer side of the spinous process of the os pubis.

The peritoneum is united by fibro-cellular tissue to the abdominal muscles, and to their tendinous expansions. Above the level of the umbilicus it is with difficulty separated from them, and this close adhesion persists for some distance below the umbilicus, upon the inner surface of the recti. Below the level of the navel the peritoneum is, however, easily detached from the transversalis muscle, a quantity of loose cellular

[21] *Obliterated hypogastric.* This fibrous cord is mentioned by Hesselbach as the 'ligamentum arteriæ umbilicalis;' but no notice is taken of the adjacent fossæ (*op. cit.* p. 19). Scarpa states that the situation of the outer (superior) fossa corresponds with the passage of the cord through the transversalis muscle, whilst the inner (inferior) corresponds with the crossing of the cord and epigastric artery. In one instance only did he find the inner fossa forming the sac of a femoral hernia. (*Treatise on Hernia*, p. 36; *Eng. Trans.* 1814. See also A. Cooper, *Crural Hernia*, p. 26, sec. edit.)

tissue, containing fat, here separating it from a more dense layer in which fibrous structure is often abundant, and which is closely applied to the muscular fibres. This is a portion of that sub-peritoneal fascia[22]

[22] *Sub-peritoneal fascia.* I venture to choose this name for the fascia which unites the peritoneum to the muscles and other structures on its exterior, to avoid the embarassing subdivisions awarded to this tissue by A. Cooper, Cloquet, and others, and named, from their relations to the muscles which they invest, 'transversalis fascia,' 'fascia-iliaca' (A. Cooper) or 'aponeurose pelvienne' (Cloquet, *Recherches Anat.* p. 62), &c. Description of sub-peritoneal fascia as one continuous layer has the advantage of simplicity, and avoids re-naming structures sufficiently well described by the earliest anatomists.

Division of the peritoneum (parietal) into an internal and external layer is of the highest antiquity. Hippocrates (*Lib.* vii. *Epidem.*) names this part of the membrane '*περιτόναια*,' using the plural number, and Galen applies to it the term '*το διπλοῦν*' (in *Administ. Anat.* lib. vi. cap. iv. v., ed. Chart. tom. iv. p. 134). The description of the external layer is given by Oribasius with remarkable accuracy. He first refers to the connexion between the transverse muscles and the peritoneum, '*καί τέταρτοι οἱ τῷ περιτοναίῳ συμφῦεις, ἐγκάρσιοι τῇ θέσει*' (quarti, qui peritonæo connati, transversum situm habent); he mentions the firm adhesion of the muscles to the membrane in the upper part of the abdomen, and then gives the separation of the sub-peritoneal fascia from the peritoneum over the lower half of the transverse muscles, '*καταλείπει μέντοι τὸ περιτόναιον ἐν τοῖς κάτω μέρεσιν ἡ ἀπονεύρωσις αὕτη, καὶ φαίνεται λοιπὸν ἐκεῖνο μόνον γυμνόν*' (*Oribasii Anat.* p. 235, ed. Dundass). The two layers, with the cellular substance between them ('Lamella constat duplici; multisque in locis substantia cellulosa cincta est.' Heister, *Compend. Anat.* tom. i. p. 76; 'the cellular substance generally containing fat.' Koch, *op. cit.* p. 262), extend, according to Columbus, from the umbilicus to the pubes. The peritoneum above the umbilicus forming but a single lamina. Fernelius, however, shows that although it appears to be single in some places, it is only by reason of the close adherence of its layers. Nor were early writers mistaken as to the difference of structure in the two layers of peritoneum.

which unites the peritoneum to all subjacent structures, but which, by reason of the absence of loose, intermediate, cellular tissue, is with difficulty shown as distinct from the peritoneum at certain parts of the wall of the abdomen.

This sub-peritoneal fascia, becoming more dense and stronger as it descends over the transversalis muscle,

The internal is distinguished as 'the membrane,' whilst the character usually assigned to the outer layer is given by Palfin, 'la membrane externe du péritoine, ou pour mieux dire le tissu cellulaire qui couvre le péritoine à l'extérieur' (*Anat. Chir.* p. 37, Paris, 1753).

Thus the term 'external layer' appears to have been conveniently applied to the tissue which immediately invested the muscles, and thus connected the peritoneum to the abdominal walls, loose cellular tissue in parts intervening. Winslow (*Exposition Anat.* p. 501) at one time denied the duplicature of the peritoneum, but it was Ruysh ('duplicaturam haud admittimus,' *Opera omnia, Cat. Rar.* p. 131, ed. 1721), who insisted that the outer layer was mere cellular tissue, which served to connect its outer surface to the neighbouring muscles and bones. Douglass confirmed and supported this view (*Description of the Peritoneum*, Lond. 1730). Following these authorities, most anatomists disregarded the outer and distinct lamina applied to the muscles, and described (Scarpa, for example), only the loose cellular covering of the peritoneum, which earlier writers regarded as the tissue connecting the inner to the outer layer.

Vidius and Cheselden were the first to write of the sub-peritoneal fascia as belonging to the muscles rather than to the peritoneum (Douglass, *op. cit.* p. 43), but their views were lost sight of, and a re-description of the external layer of the peritoneum as the fascia covering the transversalis and iliacus muscles, appeared in A. Cooper's work on hernia. The fascia over the iliacus internus was carefully examined by Cloquet, but it had been previously described by Riolan, who, whilst referring to the psoas parvus, gives an accurate account of a fibrous expansion from its tendon arching over and investing the psoas and iliacus muscles (*Op. Anat. Anth.* lib. ii. cap. xiv. p. 333, ed. 1649).

and adhering to the fascia which marks the separation between this muscle and the rectus, approaches on either side the lower border of the external oblique, to which it is united in its entire inner aspect (Note [12]) from the os pubis to and along the crest of the ileum. From this line of attachment the fascia is continued over the iliacus and psoas muscles. Approaching the inner border of the psoas it meets the side of the external iliac artery, and here divides. An upper, extremely thin, layer passes in front of the artery, and vein, extends from the edge of the external oblique (where the fascia is connected with the said vessels, and is prolonged into and blended with the fascia lata upon their front surface), and reaches the upper border of the true pelvis. An inferior layer passing beneath the external iliac vessels is also attached to the brim of the pelvis (ilio-pubic ridge), and thence the two layers, re-united, descend to join, and to assist in forming the pelvic fascia. The two layers can be recognised along the course of the circumflex vessels. The inferior, continued from beneath the iliac vessels under the femoral artery and vein,[23] passes also downwards

[23] Although the sub-peritoneal fascia is continued beneath the femoral vessels, I doubt if it be correct to describe it as prolonged upon their front surface. Such process requires considerable dissection to free it from adjacent structures, and the tissue thus separated appears to me to belong rather to the fascia lata of the thigh (see Note [12]). It has been noticed, however, by many anatomists as completing with the iliac fascia, by an extension over and around the vessels, a funnel-shaped sheath,

and forwards upon the inner side of the psoas muscle, covers, and is fixed upon the os pubis beneath the

into which femoral herniæ descend, and which forms one of their coverings. This view of its connexions is by no means of recent date.

By earlier writers the outer of the two layers of peritoneum (sub-peritoneal fascia) is said to be simply perforated by the crural vessels, but the extension of the same layer over the spermatic vessels and the round ligament is so distinctly traced, despite a certain ambiguity in the details (Bartholinus, *Instit. Anat.* p. 39, ed. 1641), that I am surprised so little credit has been given them for their description of its relations. It is written of as the 'dartos,' the peritoneum proper as 'erythroides,' the two together forming the didymis. Franco (*op. cit.* p. 29, 1561), distinguishing the two layers of peritoneum, writes: 'les quelles choses peuuent rompre ou eflargir ledit peritoine: en sorte, que les intestins descendront par ce moyen dans ces deux membranes assauoit dartos et erythroides.' Bayfield puts the matter more clearly: 'quarum interna (lamina) brevior est externâ, quia non comitatur externam usque ad testes, sed in abdominis cavitatibus definit' (*Exercitationes Anat.* p. 33, ed. 1668); and again, the peritoneum 's'ecoule le long de la guaine qui embrasse le ligament rond' (Courtial, *op. cit.* p. 77, ed. 1701).

Similar prolongations of the outer lamina were subsequently assigned to the crural vessels, and at last Mauchart claimed them as one of the coverings of crural hernia (see Note [29]), so that the hernial sacculus was one thing, and the so-called process of peritoneum another. Riolan is the first who notices this sheath for the femoral artery and vein, 'sed in parte superna inguinis, vena et arteria crurales in femur descendentes, perforant peritonæi membranam externam, ut ad inguen perveniant interna finibus ossium ilium et pubis coërcetur, nec ultra pervadit.' The outer layer alone descends (*op. cit.* lib. ii. cap. x. p. 91). See also Mauchart: 'Duabus peritonæum constat lamellis, quæ arcte cohærent, ab umbilico tamen usque ad inguen facilius ac alibi separantur, quibus interjecta est substantia cellulosa, flatu intumescens Lamina externa prolongatur et sic dictos processus, seu prolongationes peritonæi efficit' (Haller, *Disp. Chir. Select.* tom. iii.; *De Hern. Incar.* p. 80, 1722). The ending of the fascia upon the vessels is described by Koch, 'qui tamen processus non uti in inguine

pectineus, so as to form a smooth surface, extending to the obturator membrane, upon which that muscle plays, and, though occasionally adhering here and there to its fibres, from which it is sometimes separated by a small bursa. Lastly, where this prolongation of the sub-peritoneal fascia lies behind the femoral vessels, and is attached to the os pubis, it is connected for a short distance with fibres from the fascia lata as the latter dips inwards by the side of the femoral vein.[24]

longi sunt, et multum ad inferiora exporrecti, sed post brevissimum trajectum dictis vasis (vasa cruralia) firmiter accrescunt' (*De Hern. Crurali*, p. 257, 1726). See Garengeot (*L'Anat. des Viscères*, p. 180, 1742). 'Les productions du tissu cellulaire, ou de la portion externe du péritoine, sont au nombre de cinq. La seconde paire de productions est construite de ces allongements folliculeux que beaucoup d'anatomistes ont obmis, et qui accompagnant pendant quelque chemin, les vaisseaux cruraux, passent avec eux sous le ligament de Fallope, ou sous ce que les chirurgeons appellent l'arcade crurale.'

Cooper, who writes of the sub-peritoneal fascia as the fascia transversalis and fascia iliaca, describes a distinct sheath around the femoral vessels, the front of which is formed by an extension of the inner portion of the transversalis fascia beneath the tendon of the external oblique. The so-called sheath is more correctly referred to by Monro (*Observations on Crural Hernia*, p. 53, 1803) as formed in front by the fascia lata, and behind by a continuation of the fascia covering the iliacus internus. Gimbernat also writes of the fascia lata as forming its anterior wall. Descent of crural hernia on the inner side of the femoral vein, thrusting before it sub-peritoneal fascia, is well shown in some old preparations in the museum of St. Bartholomew's. The fascia is a distinct protrusion on the inner side of the vein, and internal to the position in the thigh assigned to the narrowing sheath of the said vessels. (Series xvii. 22, 23.)

[24] *Epigastric artery.* First described by Berengarius ('et una alia tendit ad musculos abdominis,' &c. *Isagogæ Breves*, p. 16, ed. 1523). Arises from

The thickness and strength of the sub-peritoneal fascia in front of the iliacus muscle depend in some measure upon the tendon of the psoas parvus (when present), which throws off a fibrous expansion, extending

the inner side, or front, of the external iliac, usually about half an inch to the outer side of the site of a crural rupture. Ascends obliquely, sometimes between the transversalis muscle and the sub-peritoneal fascia, and enters the rectus about two and a half inches above the pubes; sometimes, just above its origin, passes through an opening in the fascia, and then ascends between it and the peritoneum. The larger of its two veins is upon the inner side, and occasionally joins the obturator above the crescentic edge of the external oblique tendon. A branch from this artery is described by Tiedemann (table xxxiii. fig. 2) as extending, close to the os pubis, transversely towards the symphysis. It is often absent. The epigastric artery sometimes arises by a common trunk with the obturator (one quarter to one half an inch in length) and ascends almost vertically, a little to the inner side of the external iliac vein, to reach the rectus.

Obturator artery. I give a table from Cloquet's work, showing variations in the origin of this vessel, followed by a second table giving the results of my own observations.

Obturator arose from

I.

	males	fem.
Hypogastric (both sides)	87	73
Epigastric (both sides)	21	35
Hypogastric (one side) } Epigastric (the other) }	15	13
Femoral	2	4

II.

	males	fem.
Anterior internal iliac (both sides)	58	42
Epigastric (both sides)	8	20
External iliac (direct)	3	2
Anterior internal iliac (one side) } Epigastric (the other) }	9	17
Femoral	5	4
Internal circumflex	2	

In two cases, either on the left side, the internal circumflex arose from a branch of the external iliac, common also to the epigastric and obturator. The artery descended on the inner side of the femoral vein, at first on a plane superficial to it, and passed beneath the crural vessels at the termination of the saphenous.

In July 1857, Mr. Stanley operated at St. Bartholomew's upon a strangulated femoral hernia. The sac was opened. Slight oozing of blood followed, but not to any great extent, and the patient (a female aged

from the inner border of the psoas magnus, beneath the iliac vessels, even to the margin of the external oblique tendon and to the crest of the ilium. In all cases, whether this fibrous expansion does or does not exist, the part of the sub-peritoneal fascia connected with the outer two-thirds of the tendon of the external oblique is always dense and resisting, and thus effectually binds down the subjacent psoas and iliacus muscles.

The sub-peritoneal fascia forms an uninterrupted barrier to the escape of the contents of the abdomen beneath the tendon of the external oblique. A barrier of great strength from the outer side of the external iliac artery to the crest of the ilium, but comparatively weak from the inner side of the iliac vein to the ilio-pubic ridge, where the fascia is represented by the thin anterior layer passing in front of the iliac vessels.[25]

53) was removed to her bed. Half an hour afterwards the house surgeon, Mr. E. Barker, to whose kindness I am indebted for the history of the case, found the wound bleeding profusely. He arrested the hæmorrhage by manual pressure until Mr. Stanley's arrival. The wound was then enlarged upwards and inwards, and the bleeding vessel was secured. It proved to be a large artery curving above the sac and towards the pelvis, that is in the direction occasionally taken by the obturator. The patient recovered. This is the only instance in which I have met with this artery in front of a crural hernia sac. In all those cases in which it arose from the epigastric, femoral, or internal circumflex, the obturator curved below the site of the route taken by a crural rupture on its way to the pelvis.

[25] It is in this portion of the sub-peritoneal fascia that a few fibres stronger than its remaining constituents form in some subjects a distinct band which, beginning on the outer side of the iliac artery where the fascia divides into its two layers, arches

THE recti, transverse, and internal oblique muscles are immediately external to the sub-peritoneal fascia, and require brief notice. The rectus, at its connection with the os pubis, occasionally throws off some tendinous fibres, which pass behind and strengthen the tendon of the external oblique, and are attached to the commencement of the ilio-pubic ridge.[26] Here, also, a few fibres from the transverse and internal oblique muscles frequently insert themselves, those from the transverse being the more posterior. These fibres sometimes form a distinct tendinous band, with occasionally a bundle of muscular fasciculi, which arches over the external iliac vessels to be inserted into the ilio-pubic ridge behind the tendon of the external oblique.

These fibres complete the structures which are applied to and which strengthen the inner, horizontal portion of the tendon of the external oblique. Its outer surface is firmly connected with the fascia lata, its inner is covered by sub-peritoneal fascia, and is still further supported by straggling fibres from the rectus muscle, and from the transversalis.[27]

over the great vessels and is attached behind Gimbernat's ligament into the ilio-pubic ridge. ('Fibræ crassiores ligamenti inguinalis interni,' Hesselbach, *op. cit.* p. 10.) They offer some resistance to the finger when the latter is passed from within outwards along the route of a crural rupture.

[26] I have not succeeded in finding any structure on the lower posterior surface of this muscle which could be reconciled with Breschet's 'ligament sus-pubien' (*Consid. Anat.* p. 125).

[27] Liston objects to the crescentic attachment as part of the external oblique, and regards

If the sub-peritoneal fascia be reflected from the inner side of the lower extremity of the external iliac vein, or if the fascia lata be removed from the inner side of the crural vessels (here surrounded by dense reticulated tissue), a small collection of fat, held together by connective tissue, is exposed to view.[28] In its midst are the absorbents on their way from the thigh into the abdomen, and occasionally one or more lymphatic glands. It follows that the structures which here separate the contents of the abdomen from the front of the thigh are, 1, peritoneum; 2, sub-peritoneal cellular tissue; 3, the thin layer of sub-peritoneal fascia passing from over the external iliac vein to the ilio-pubic ridge; 4, tendinous fibres from the transversalis and internal oblique muscles; 5, fascia lata.

it as a structure distinct in itself. He writes, 'It is divided into three layers; the anterior is formed by the twisting in of the falciform process, the internal layer by the attachment of the fascia transversalis, forming the inferior pillar of the internal ring. The middle layer is formed by the attachment of the lower part of the combined tendon of the internal oblique and transversalis to the crest of the pubis, and the descending fibres are strengthened by a strong cross slip from the opposite rectus' (*op. cit. p.* 13).

[28] See Mauchart (*op. cit.* p. 156): 'Foramen hoc ovale, in statu naturali, repletur partim illis ipsis tendinibus, vasis et nervi trunco, partim obtegitur intus lamina peritonæi interna, partim fibris reticularibus portionis cellulosæ peritonæi interpolatur, ut sic plures uno ponantur obices elapsuris hac via contentis abdominis.' Cloquet has described some fascia, perforated by openings for the lymphatics, as extending between the vein and the posterior edge of the external oblique tendon (septum crurale). (*Recherches Anat.* p. 73.)

When herniæ escape at this point they push before them and derive coverings[29] from each of these structures, taking their peritoneum[30] (sac) from the pouch on the outer side of the obliterated hypogastric artery.

[29] Mauchart deserves credit as being the first to write an accurate account of the coverings of a femoral hernia. 'Saccus hernialis etiam in hernia crurali duplex est, externus et internus, nisi quidem hernia acciderit per violentam laminæ peritonæi internæ rupturam ac perforationem : externus saccus conficitur partim a substantia cellulosa et externa lamina peritonæi, quæ comitatur vasa cruralia abdomine exeuntia, partim a fibris aponeuroticis arcus tendinosi musculorum obliqui externi et interni : internus vero a lamina peritonæi interna, foras protrusa et instar infundibuli in inguen et femoris supernam regionem anticam dilatata' (*op. cit.* p. 152).

It will be observed that this extract comprises a correct description of the covering of the hernia named by subsequent writers 'fascia propria.' Respecting the productions of the external layer of the peritoneum, see Note [23].

[30] Paulus, and all writers upon this subject up to the time of Fabricius, were particular in giving amongst the causes of hernia, rupture of the peritoneum as distinct from its dilatation, especially if the tumour appeared on a sudden. Rhases first insisted that as a rule no such rupture took place. Ruysch was in later days a strong opponent of the rupture of this serous membrane, also Zwingerus (*Pœdojatreia*, ed. 1722). Dionis is one of the last who maintains the frequency of rupture, especially with umbilical hernia (*Cours d'Opérat. de Chir.-Démonst.* 2).

Unusual complications may deprive a crural rupture of its serous covering, such as the destruction of the portion of peritoneum, whence the sac should have been derived, in consequence of a penetrating wound, its perforation by an abscess, or its division in an operation for the relief of a strangulated hernia and the substitution in such cases of an ordinary cicatrix in its stead. Herniæ, also, which consist of portions of the intestinal canal partially covered by peritoneum, as the cæcum, ascending and descending colon, or sigmoid flexure, become displaced without an investment of serous membrane, the descent of the cæcum being especially favoured by the laxity of its connexion with subjacent structures. Should the bladder escape beneath the

EACH femoral hernia makes for itself (for neither outlet exists in the natural anatomy of the region) a crural canal and a crural (femoral) ring, the latter being the beginning of the canal. The boundaries of

external oblique, it will pull after it the peritoneum reflected upon its walls, which forms a kind of funnel, and quickly fills with intestine and omentum. (See Garengeot, *op. cit.* p. 103.)

The condition of the peritoneum varies in different subjects. It may be thin, or dense, easily torn or resisting (Koch, *op. cit.* p. 256), and is especially weak when fat is accumulated beneath it. Its consistency varies even in the same body, a fact long ago noticed by Galen (lib. vi. *De Administ. Anat.* cap. v.). The elasticity also of this membrane differs with age, with individuals, and after certain diseases, for example, such as commonly involve the parts contained within the female pelvis. Its natural elasticity is remarkable ('facile distendi citra ruptionem' Spigelius, *op. cit.* p. 215). It will yield under, but support, a weight of fifteen pounds, and will subsequently return to its previous position (Scarpa, *op. cit.* p. 33). In the dead subject the parietal peritoneum can easily be drawn far beyond the tendon of the external oblique, partly by displacement, partly by yielding of its tissue. There are great differences in the extent to which it can recover after being overstretched, differences which Cloquet endeavours to account for by the changes he associated with the term 'éraillemens,' cracks, or fissures (see *Recherches Anat.* p. 46). When permanently protruded as the sac of a hernia, it is apt to become thick, even cartilaginous, and occasionally osseous (Breschet, *op. cit.* p. 69). Less often it wastes and may disappear altogether. February 1st, 1853, a female, æt. 55, required to be operated upon for a femoral rupture, strangulated four days and a half, she having noticed a tumour in her groin, never reduced, two and a half years. Mr. Wormald returned the intestine, which was quickly exposed in the course of the operation. The patient died with gangrene of the bowel and peritonitis. In making a post-mortem examination, the peritoneal sac was in part absent. The serous membrane, attached about the ring to the structures on its exterior, when traced beyond the groin became very thin, and presently ended, and so a free opening led to the thigh from the cavity of the abdomen.

the ring, external to the parts protruded, are in front and on the inner side the curved posterior edge of the external oblique tendon, behind the fibres of the pectineus muscle, or, if the origin of this muscle from the ilio-pubic ridge is less broad than usual, the layer of sub-peritoneal fascia extending to and covering the os pubis, and on the outer side the femoral vein, surrounded by dense cellular tissue. The ring[31] is narrow from side to side as compared with its depth, and the extent to which the external oblique is inserted into the ilio-pubic ridge and the height of the pubic spine (Plate I.) occasion some variations in its attainable size. From the crescentic direction of the posterior edge of the tendon of the external oblique, it follows that the ring is narrow in front and behind as compared with its middle portion.

The crural canal has an extreme length of from one inch to one inch and a half, and the direction of its axis is uniformly downwards and forwards. Its walls

[31] Observe the sharply defined edge which bounds the femoral ring in front, and compare it with the smoothly inclined surface which is its limit behind. When a crural hernia has once formed, it usually increases by the escape of fresh portions of intestine, or of omentum, behind the part first protruded. It is easier for them to descend over the smooth incline than to force their way beneath the sharp anterior margin. In practice, it results that the parts of the hernia most deeply seated, those last protruded, should be first returned into the abdomen. Attention to this rule facilitates their reduction. 'Semper observavi quod illa intestini delapsi pars quæ ossi pubis fuerit proxima ultima exciderit et prima reducatur' (N. le Quin, *op. cit.* p. 54).

are formed by the vein and its surroundings on the outer side, by the fascia lata of the thigh in front and on the inner side, and by the pectineus muscle and sub-peritoneal fascia (attached to the os pubis and fascia lata) behind. The whole canal is funnel shaped, broad above, and narrowing to a point where the saphenous vein opens into the femoral.

Nearly all crural herniæ,[32] thus descending along

[32] Parts protruded. *a. Mesentery* (*μέσος ἔντερον*, meseræum). This suspensory ligament ('*τὴν συνδέσμου παρέχει*,' Oribasius, *op. cit.* p. 108), first described by Galen, was adopted by certain surgeons as the principal cause of hernia, especially of the inguinal. Their doctrine, originated by Wharton (*Adenograph.* p. 56, Amst. 1659), supported by Benevoli (*Dissertazione* I.), Roscius (*Act. N. C.* tom. ii. obs. 178), Brendelius (*Progr. de Hern. Natalibus*), and Morgagni (*Epist.* xliii. c. 13), is this: hernia is caused by the relaxation and elongation of the mesentery, for the intestine cannot be removed from its natural situation but in so far as it is permitted by the unnatural elongation of a portion of the said mesentery. 'Intestina autem omnia a mesenterio et mesacolo ita lumbis adligantur, ut prolabi nequeant, etiamsi nullum esset abdomen' (Camper, *Icones Hern.* p. 11, ed. 1801). This idea obtained some support in the absence of exact anatomical knowledge. How little the width of the mesentery varies in different subjects, due allowance being made in each for the age and for the height, is indeed remarkable. I would say, from a large number of observations, that such variations are practically insignificant; yet in all cases small intestine can readily prolapse from the abdomen. The attached border of the mesentery (radix mesenterii) is firmly connected with the vertebræ and other subjacent structures for a distance (in the adult subject) of from three and a half to six inches, extending from the left side of the second lumbar vertebra toward the right sacro-iliac synchondrosis (Plate IV. fig. 3, *a b*). Its upper connexion remaining constantly the same, its lower varies the two or more inches. If portions of the ileum and of the jejunum are successively pulled towards the pubes, *i*, *i*, in the dead subject, each portion will be found to

PLATE IV.

Fig. I. Fascia lata, showing large irregular openings for the passage of absorbents.

Fig. II. Fascia lata, showing smaller and well-defined apertures.

Fig. III. Diagram to illustrate Note xxxi. Section *a*.

Plate IV.

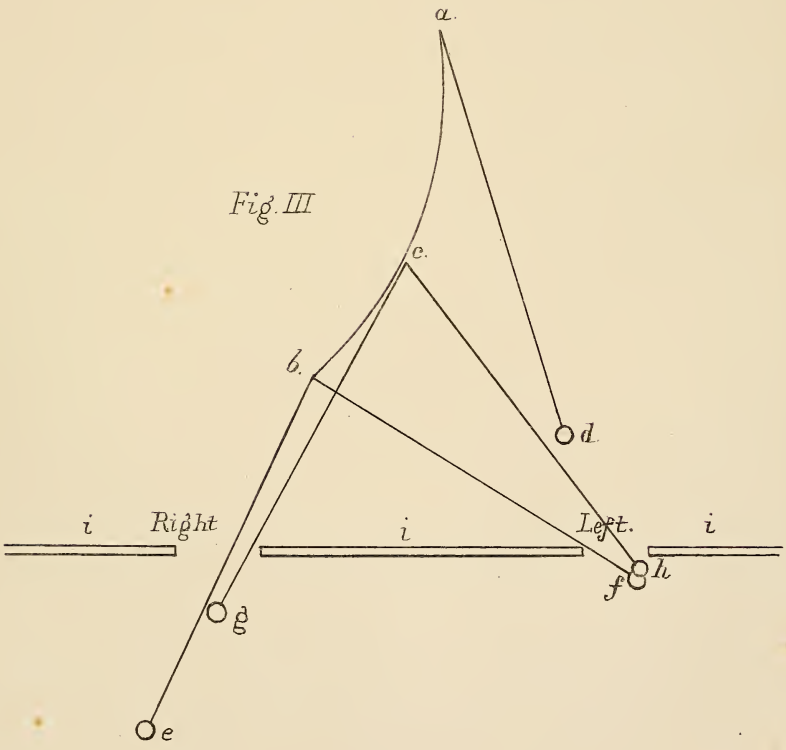


Fig. I.



Fig. II.

Fig. III



the course of the absorbents, push before them the sub-peritoneal fascia, until they reach the fascia lata and

drag upon one point only of the line *a b*. Thus, without any difference in the breadth of the mesentery, a portion of jejunum, *d*, connected with the root at *a* will scarcely reach the os pubis; but a portion of ileum suspended from *b* will easily pass beneath the tendon of the external oblique muscle, and one inch or more beyond towards the thigh, on the right, *e*, and to a somewhat less distance on the left side, *f*; whilst an intermediate portion of intestine, as *c*, *h*, or *c*, *g*, will also descend, though to a less distance, beyond the same tendon. As intestine so easily passes beyond the lower boundaries of the abdomen, it is evidently an error to suppose that its protrusion (hernia) requires a prior elongation of this ligament. Reference to the diagram (Plate IV. fig. 3) also shows that the right side is more favourably disposed for the occurrence of an intestinal hernia than is the left, for the nearer the small intestine approaches the cæcum (the six or eight last inches excepted) the more readily and the further can it protrude.

The mesentery is easily stretched beyond its natural breadth. After passing a portion of ileum beneath the external oblique tendon, and attaching to it weights, which played, by means of a cord, over a pulley fixed at the feet of the body, as it lay on the post-mortem table, I found that three pounds (avoird.) sufficed to pull the intestine on an average four inches beyond the lower border of the external oblique. On removing the weight, the recoil of the mesentery would sometimes replace the intestine within the abdomen, sometimes its action was inappreciable. The varying condition of the peritoneum, and the extent to which the displacement had resulted from yielding of the tissue which connects the mesentery with the vertebræ, appeared to account for these differences.

Thus, in the dead body, portions of small intestine can be protruded beyond the lower border of the external oblique by permission of the mesentery, and a slight force will draw that yielding ligament far beyond the outer limits of the abdomen.

b. The *omentum* ('quasi ommentum, ab ommento, quod est supra maneo' Riolan, *op. cit.* cap. xiii. p. 95; also epiploon, ἐπιπλέω; δέρτρον, Hippocrates, lib. v. *Epidem.*; γάγγαμον, rete vel reticulum, Verheyen, *op. cit.* p. 88; the Zirbus of Arabian surgeons) varies in the extent to which it covers the intestines. In children reaching

experience its resistance. They then follow one of three courses; 1, most commonly they burst through the

to the umbilicus, in adults lower as age advances, especially if laden with fat. ('In nonnullis tamen illud desinere ad umbilicum; in aliis ad os pubis extendi testantur autores' Verheyen, *op. cit.* p. 89). Sometimes it adheres to the pubes and descends into the pelvis, sometimes it is rolled up about the greater curve of the stomach. A condition attributed by Arnaud (*Mémoires de Chirurg.* p. 409, ed. 1765) to violent movements of the intestinal canal, as after lead poisoning. Albrechtus (*Ephemer. German.* tom. ix. obs. 83) first notes its congenital absence, see also Helvechius, tom. xxiv. obs. 204, quoted by Arnaud. According to Spigelius (*op. cit.* cap. vi.) it is longer in women than in men, an old-fashioned error; according to Vesalius, it descends lower on the left side, on account of the curve of the stomach being there greater and lower. Most often protruded with umbilical hernia, less often with the inguinal, and least of all with the femoral. The omentum, when the two protrude together, generally escapes in front of the intestine. The protruded omentum, even in femoral ruptures, is always prone to increase, partly by escape of fresh portions, partly by certain changes which it, the protruded omentum, undergoes ('inde postquam proprium situm amisit, induratur et crassescit, sicque difficilius regreditur quam egressu fuerit,' N. le Quin, *Tract. de Herniis*, p. 49, ed. 1654. Also Lavater, *De Enteroperistole*, p. 50, ed. 1671). This increase is in some measure due to the pressure upon its veins at the point where the omentum leaves the abdomen, and the consequent obstruction to the return of the venous blood, a pressure which the arteries with their stronger walls resist more effectually and so continue the full arterial supply. Hence results mixed œdema and cellular hypertrophy. Much the same state of things as gives rise to elephantiasis of a lower extremity, in cases of obstruction to the superficial vein circulation by extensive ulceration.

One good result occasionally follows from protrusion of the omentum in front of the intestine, in that it saves the bowel from the sharp edge of the external oblique tendon ('parceque la pression de l'anneau est plus vive sur l'epiploon qui couvre l'intestin' Chopart, *Traité des Mal. Chir.* tom. ii. p. 204, ed. 1796). Lying in front of the intestine, the omentum sometimes makes it difficult to employ the hand pressure necessary to

fascia of the thigh at one of the openings for the transmission of the absorbents; 2, less frequently they are

reduce a strangulated femoral hernia. Sometimes the gut, pressing upon such a covering, causes wasting and perforation of the omentum, and occasionally the latter, by adhering to the sac, forms openings through which intestine may pass and become strangulated. A female, æt. 54, had a femoral rupture for three years which became strangulated, and was operated upon in St. Bartholomew's Hospital on April 7th, 1854. The bowel was returned without opening the sac, but she continued to suffer great pain, and the sickness and constipation persisted. Mr. Paget considered it advisable to open the abdomen, cutting upwards from the first incision. A portion of ileum was thus exposed, girt and its canal obstructed by a piece of dead omentum, which adhered to the edge of the ring, and which had formed, in all probability, the mass of the hernial protrusion. The intestine was gangrenous, and the patient died.

c. Intestine. Although the doctrine of Riolan, 'experientia docet solum Ileon (εἰλεὸς, by the best Greek writers, is employed with reference to the disease 'iliac passion,' and λεπτὸν, thin, is the name given to this portion of the small intestine) pubi proximum enterocelem facere' (*Opera Anat.* p. 106) no longer holds good, we may note that it is very seldom any structures are protruded beneath the external oblique except small intestine and omentum. Isolated cases, repeatedly quoted by successive writers, exaggerate the apparent frequency of unusual crural ruptures. The cæcum and sigmoid flexure, however, occasionally protrude, and the first named has been known to form a femoral hernia on the left side. (Thibaut, quoted by Mauchart, *De Hernia Incarcerata*, p. 82). The left colon has passed into the right groin (Lassus, *Méd. Opérat.* tom. i. p. 173, ed. 1795). Monro, jun., names a diverticulum from the small intestine as becoming strangulated in a crural hernia. Strangulation of a testicle is thus referred to by Scarpa: 'A boy, about seven years of age, had forced the left testicle into the abdomen; two years afterwards, the inguinal ring having probably become unusually contracted, the testicle passed under the femoral arch, with all the symptoms of strangulated hernia, on account of which he was obliged to undergo the operation' (*Treatise on Hernia*, Eng. Trans. p. 235, ed. 1814). The left ovary was detected by Hunter as strangulated in a femoral rupture (Chevalier, *Med. Chir. Trans.*

arrested in their descent by the fascia, and then increase by extending over and directly in front of the femoral vessels—these ruptures are small; 3, and these are of rare occurrence, they separate the fascia lata from the pectineus, and then descend, still beneath the fascia, directly in front of the muscular fibres. The resistance offered to the descent of a crural rupture, by the structures external to the fascia lata, has been already referred to.

Independently of the general pressure exercised by the walls of the so-called crural canal, the femoral hernia[33] is liable to be tightly pinched where crossed

vol. iv. p. 329.) Lallemand (*Bulletins de la Faculté de Med. de Paris*) gives a case in which the uterus and fallopian tubes were the parts protruded. The occurrence of these unusual herniæ has been verified since these observations, but the cases are few and far between. Quite recently Mr. Skey operated upon a crural rupture which consisted of constricted gall bladder, the liver, in an aged female, being greatly elongated towards the os pubis (Museum of St. Bartholomew's, series xvii. 96). Protrusion of the bladder (cystocele) has occurred, with one or two exceptions (see Scarpa, *op. cit.*) at the inguinal rings. For cases of external inguinal rupture simulating femoral see Key, *On Dividing the Stricture*, p. 25, Monro, *Morbid Anatomy*, p. 467.

[33] *Treatment.* As but little credit is now given to surgeons prior to Petit for their management of hernia, I would refer the reader to the excellent treatises by Franco (1560), Paré (1562), and N. le Quin (1648). Although the descriptions, from their imperfect knowledge of anatomy, are in some particulars difficult to realise, yet I doubt if their practice fell far short of that of a very recent date. Their directions for the treatment of reducible ruptures (N. le Quin), for the management of the irreducible and incarcerated (Franco), and their condemnation of many of the operations (all of which they regarded as most serious) for the cure of these

by bands of dense unyielding tissue, such as the margin of any opening in the fascia lata through which

disorders, and their denunciation of the charlatans by whom they were undertaken, and whose results had brought treatment into such disrepute (Franco, Paré, Fabricius, and others), are distinct and concise.

The operation for the relief of the gut when strangulated was not to be delayed beyond twenty-four hours, bath, laxatives, injections, position (raising of the feet when the ileum had descended—Lavater, *De Entero-Peristole*, p. 55, 1672), being first resorted to. The external incision was to be small ('ad longitudinem digitorum duorum transversorum,' Lavater, op. cit. p. 56), and the further steps of the operation, described in the following extract, show that, when possible, they avoided opening the peritoneal sac, and performed the so-called operation of Petit: —

'Après auoir tenté tous autres moyens, lesquels sont dits en la cure d'hernie par médecines, nous viendrons à la main. Il fault auoir vn petit baston de la grosseur d'une plume d'oye, ou vn peu plus gros, rond et qui soit plat d'un costé, et demy rond. Il sera rond deuant: afin qu'il entre plus facilement. Or fault-il faire l'incision à la plus haulte partie du scrotum, tirant vers le penil, et faire l'ouuerture au commencement telle, que le baston y entre, se gardant de rien toucher aux intestins comme a esté dit au chapitre precédent. Ayant trouué le didyme, on passera le baston entre iceluy et la chair du penil: et le fault pousser en hault en contremont. Le costé plat dudit baston sera dessus, à cause qu'en coppant, s'il estoit tout rond, ne se feroit si facilement: pource que le scalpelle ou rasoir couleroit d'un costé ou d'autre. Ayant mis la pointe du baston assez auant, on coppera la chair du scrotum ou penil sur le costé plat du baston: afin de ne blesser les intestins, ayant fait bonne ouuerture, car n'y a dãger de la faire assez longue: afin qu'ils se puissent reduire plus à leur aise: parceque le didyme et chair de mirach se pourront mieux relargir par ce moyen, qui pourra estre cause que les intestins seront reduits en leur propre lieu. Il faudra donq essayer à les remettre dedans petit à petit. Et cas aduenant, que facilement sans guères les presser, ne se voulsissent reduire, à cause de la grande abondance de matière, ou inflammation, faudra procéder par ce moyen: assauoir prendre le didyme, et le copper tout bellement sur l'ongle comme auons dit, en esleuant les membranes du didyme auec crochets, et le

it may have been forced, the posterior crescentic border of the external oblique tendon and the fibres, when present, which pass to the ilio-pubic ridge from the transversalis and internal oblique muscles.

In dividing these structures for the relief of strangulated intestine, the incisions should be as small as possible, for these fibrous tissues repair but imperfectly, and, when they have been too freely incised, leave a great gap by the side of the crural vein, through which the hernia readily recurs.[34] The constricting bands con-

copper iusques aux intestins: et ayant fait ouuerture par où le baston pourra passer, on le mettra entre les intestins et les membranes du didyme en le poussant tout bellement auant en contremont, et en le tenant esleué en hault: afin de mieux iuger s'il prend aucuns des intestins toutefois ne sont pas faciles à prendre d'autant qu'ils sont vnis et glissans. Alors on coppera le didyme sur ledit baston iusques au péritoine, ou plus haute partie, qui est vers le trou, par où commencent les intestins à descendre au scrotum, mais fault faire bonne ouuerture au peritoine, sans rien craindre, pour plus grande asseurance, et comme l'on fait en telles choses desesperées.' (Franco, op. cit., p. 46.)

[34] Two years after the operation I had an opportunity of examining the body of a male patient who had been under treatment for a strangulated crural hernia in St. Bartholomew's Hospital. The accompanying diagram will give an idea of the



extent to which the opening by which the crural rupture descended, had been permanently enlarged by the incision (the edges of which were thick and hard) through the tendon of the external oblique. A like result follows after over-free division of certain fibrous structures for the relief of strangulated inguinal hernia. There is at present under my care in the hospital a man who was thus operated upon eleven years ago, and through whose external ring the entire hand can be now thrust inwards towards the abdominal cavity.

nected with the fascia lata vary greatly in their relations to the hernia, owing to the many apertures in that structure through which the rupture may thrust itself, and as these bands are a very frequent cause of strangulation, their variations should be borne in mind by the surgeon whilst operating for the relief of the intestine.

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